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Brachyurans from the Upper Jurassic (Kimmeridgian – Tithonian) of Pfalzpaint and Breitenhill (Bavaria, S Germany)

Abstract - Three brachyurans were collected from the Upper Jurassic lithographic limestones (Kimmeridgian – Tithonian boundary beds) of Pfalzpaint and Breitenhill quarries (E of Eichstätt, Bavaria). The specimens were ascribed to *Pithonoton marginatum* (v. Meyer, 1842), *Pithonoton* cfr. *P. serratum* (Beurlen, 1929) and *Pithonoton* sp. (infraorder Brachyura Latreille, 1802, family Prosopidae v. Meyer, 1860). Even though *P. marginatum* and *P. serratum* are already known from the Upper Jurassic of Germany, it is their first record from the lithographic limestones of the Pfalzpaint and Breitenhill quarries.

Key words: Crustacea, Decapoda, Jurassic, Germany.

Zusammenfassung - Brachiuren aus den oberjurassischen Plattenkalken (Kimmeridgium – Tithonium) von Pfalzpaint und Breitenhill (Bayern, Süddeutschland).

In den oberjurassischen Plattenkalken von Pfalzpaint und Breitenhill (Kimmeridgium – Tithonium – Grenzbereich) östlich Eichstätt wurden drei Exemplare von Brachyuren nachgewiesen. Sie wurden den Arten *Pithonoton marginatum* (v. Meyer, 1842), *Pithonoton* cfr. *P. serratum* (Beurlen, 1929) und *Pithonoton* sp. (Unterordnung Brachyura Latreille, 1802, Familie Prosopidae v. Meyer, 1860) zugeordnet. Obwohl *P. marginatum* und *P. serratum* aus dem Ober-Jura Deutschlands schon bekannt sind, stellen sie deren Erstnachweis aus Plattenkalken der Steinbrüche bei Pfalzpaint und Breitenhill dar.

Schlüsselwörter: Crustacea, Decapoda, Jura, Deutschland.

Riassunto - Brachiuri del Giurassico superiore (Kimmeridgiano – Titoniano) di Pfalzpaint e Breitenhill (Baviera, S Germania).

Tre brachiuri scoperti nelle cave di Pfalzpaint and Breitenhill (Eichstätt, Baviera) provengono dal Giurassico superiore (limite Kimmeridgiano – Titoniano) della Germania meridionale. Gli esemplari sono stati attribuiti a *Pithonoton marginatum* (v. Meyer, 1842), *Pithonoton* cfr. *P. serratum* (Beurlen, 1929) e *Pithonoton* sp. (infraordine Brachyura Latreille, 1802, famiglia Prosopidae v. Meyer, 1860). Anche se *P. marginatum* e *P. serratum* sono già conosciuti nel Giurassico superiore della Germania, si tratta della loro prima segnalazione nelle cave di Pfalzpaint e Breitenhill.

Parole chiave: Crustacea, Decapoda, Giurassico, Germania.

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Introduction

Although prosopid crabs are quite common in the upper Jurassic of southern Germany, they are almost unknown from lithographic limestones, which are otherwise famous for their excellently preserved decapod fauna. Hitherto only two specimens are recorded, a *Pithonoton* from the lithographic limestones of Pfalzpaint (Röper *et al.* 1999, see below) and a poor impression of an indeterminable prosopid from Zandt preserved with its pereopods (Frickhinger 1994, Fig. 229). Herein we add some recently recovered other specimens from lithographic limestones.

Provenance and age of the studied material

The lithographic limestones of the Upper Jurassic in Franconia are often summarised as “Solnhofen Lithographic Limestones”. However these localities span a large area of hundreds of square kilometres. According to their ammonite faunas, they are not coeval as previously thought because of their similar lithology, but span the time interval between the middle late Kimmeridgian and the lower early Tithonian (Upper Jurassic).

The biostratigraphic frame of the upper Kimmeridgian (Upper Jurassic) was worked out by one of the authors (Schweigert *et al.*, 1996), whereas the succession of ammonite faunas of the lower Tithonian is still being worked out.

The quarry district of Pfalzpaint is located ca. 10 km NE of Eichstätt (Fig. 1). Today most of the quarries in this area are abandoned because of their poor quality, but recent excavations have provided interesting data on the lithology and fossil content of these limestones. They are well-known especially for their nicely preserved jellyfishes and numerous remains of horseshoes crabs, often with their trail behind. The ammonite fauna of Pfalzpaint comprises *Neochetoceras bous* (Oppel), *Silicisphinctes irregularis* (Ohmert & Zeiss) and *Taramelliceras rebouletiaum* (Fontannes) thus suggesting a latest Kimmeridgian age (Beckeri Zone, uppermost Ulmense Subzone). The following decapod crustaceans have been recorded from Pfalzpaint: *Eryma modestiforme* Schlotheim, 1822, *Pseudastacus pustulosus* (Münster, 1839), *Mecochirus brevimanus* Oppel, 1862, *Magila desmarestii* (Münster, 1839), and the prosopid crab *Pithonoton* sp. In contrast to many other lithographic limestones, the Pfalzpaint quarries often yield horizons with benthic organisms, like brachiopods, small bivalves and gastropods, regular echinoids, marine algae and strange siliceous sponges. Even sessile crinoids have been recorded pointing to nearby hardground environments. For more details on the fossil content and lithology see Röper *et al.* (1999).

The Öchselberg quarry near the village of Breitenhill is located ca. 25 km E of Eichstätt, 2.5 km E of Zandt (Fig. 1). The therein exposed lithographic limestones belong to the more biodetritic Öchselberg Member of the Painten Formation (Zeiss, 1977, Fig. 8), the age of which is around the Kimmeridgian – Tithonian boundary. The fossil content of these limestones is poorly known because the material is wide-spread in numerous private collections. Decapod crustaceans are said to be quite common, like in the overlying Zandt Member. Recently, the penaeid species *Bylgia ruedeli* has been described from this locality (Schweigert & Garassino, 2004).

The studied specimens in dorsal view are preserved in a thin layer of litho-

graphic limestone. Their preparation was easy for the soft consistency of the surrounding matrix. The three specimens were ascribed to *Pithonoton marginatum* (v. Meyer, 1842), *Pithonoton* cfr. *P. serratum* (Beurlen, 1929) and *Pithonoton* sp. (infraorder Brachyura Latreille, 1802, family Prosopidae v. Meyer, 1860).

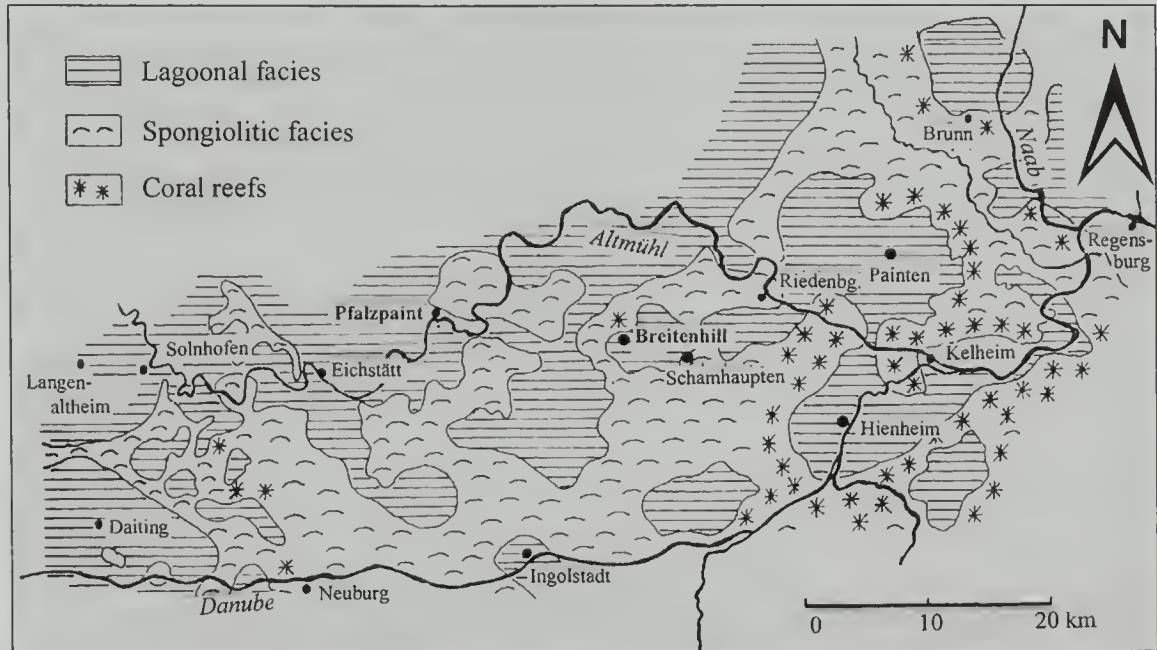


Fig. 1 - Paleogeographic map of the Upper Jurassic in Franconia with the location of the fossiliferous quarries (modified after Röper *et al.*, 1999).

Fig. 1 - Carta paleogeografica del Giurassico superiore in Franconia con l'ubicazione delle cave fossilifere (modificato dopo Röper *et al.*, 1999).

Acronyms. BMMS: Bürgermeister-Müller-Museum, Solnhofen, Germany;
JME: Jura-Museum, Eichstätt, Germany.

Systematic Palaeontology

Infraorder Brachyura Latreille, 1802
Section Podotremata Guinot, 1977
Subsection Dromiacea De Haan, 1833
Superfamily Homolodromioidea Alcock, 1899
Family Prosopidae v. Meyer, 1860
Subfamily Pithonotinae Glaessner, 1933
Genus *Pithonoton* v. Meyer, 1842

Type-species: *Pithonoton marginatum* (v. Meyer, 1842)

Pithonoton marginatum (v. Meyer, 1842)
Figs. 2, 3

1842 - *Prosopon* (*Pithonoton*) *marginatum* v. Meyer; p. 70, Pl. 15 (Fig. 3)

- 1842 - *Prosopon (Pithonoton) rostratum* (pars) v. Meyer; p. 74, Pl. 15 (Fig. 6)
- 1860 - *Prosopon marginatum* v. Meyer; p. 198, Pl. 23 (Figs. 8-9)
- 1869 - *Prosopon marginatum* v. Meyer in Gemmellaro; p. 11, Pl. 2 (Figs. 48-49)
- 1889 - *Prosopon marginatum* v. Meyer in Moericke; p. 64, Pl. 6 (Fig. 22)
- 1895 - *Prosopon marginatum* v. Meyer in Remes; p. 202, Pl. 2 (Fig. 13)
- 1905 - *Prosopon marginatum* v. Meyer in Remes; p. 35
- 1925 - *Pithonoton marginatum* (v. Meyer) in Van Straelen; p. 363, Fig. 167
- 1925 - *Prosopon marginatum* v. Meyer in Beurlen; p. 473
- 1929 - *Pithonoton marginatum* (v. Meyer) in Glaessner; p. 322
- 1929 - *Pithonoton marginatum* (v. Meyer) in Lörenthey & Beurlen; p. 84, Pl. 3 (Fig. 8)
- 1929 - *Pithonoton marginatum* (v. Meyer) in Beurlen; p. 126
- 1929 - *Pithonoton laevimarginatum* Lörenthey & Beurlen; p. 85, Pl. 4 (Fig. 2)
- 1929 - *Pithonoton laevimarginatum* Lörenthey & Beurlen in Glaessner; p. 321
- 1929 - *Coelopus tuberculatus* Lörenthey & Beurlen; p. 94, Pl. 4 (Fig. 1)
- 1929 - *Coelopus tuberculatus* Lörenthey & Beurlen in Glaessner; p. 123
- 1929 - *Pithonoton marginatum* var. *antecedens* Beurlen; p. 130, Text-fig. 3
- 1933 - *Pithonoton laevimarginatum* Lörenthey & Beurlen in Glaessner; p. 180
- 1933 - *Pithonoton marginatum* (v. Meyer) in Glaessner; p. 180
- 1933 - *Coelopus tuberculatus* Lörenthey & Beurlen in Glaessner; p. 181
- 1947 - *Pithonoton marginatum* (v. Meyer) in Bachmayer; p. 40
- 1951 - *Pithonoton marginatum* (v. Meyer) in Withers; p. 175, Text-figs. 4-6
- 1960 - *Pithonoton marginatum* (v. Meyer) in Patruilius; p. 253
- 1963 - *Pithonoton marginatum* (v. Meyer) in Houša; p. 106, Pl. 1 (Fig. 4)
- 1964 - *Pithonoton marginatum* (v. Meyer) in Bachmayer; p. 131
- 1966 - *Pithonoton marginatum* (v. Meyer) in Patruilius; p. 510, Pl. 31 (Figs. 15-16)
- 1966 - *Pithonoton rusticum* Patruilius; p. 511, Pl. 31 (Figs. 17-18)
- 1967 - *Dromiopsis* ? in Levin; p. 227, Text-figs. 2-3
- 1969 - *Pithonoton marginatum* (v. Meyer) in Bachmayer; p. 121, Text-fig. 148
- 1970 - *Pithonoton marginatum* (v. Meyer) in Mutiu & Bădăluță; p. 453, Pl. 2 (Fig. 8)
- 1979 - *Pithonoton marginatum* (v. Meyer) in Förster; p. 25, Text-figs. 5C-6B
- 1980 - *Pithonoton marginatum* (v. Meyer) in Morris; p. 14
- 1981 - *Pithonoton marginatum* (v. Meyer) in Götzner; p. 416, Text-fig. S. 417
- 1988 - *Pithonoton marginatum* (v. Meyer) in Wehner; p. 79, Text-fig. 23, Pl. 5 (Fig. 8), Pl. 6 (Fig. 1)
- 2000 - *Pithonoton marginatum* (v. Meyer) in Müller, Krobicki & Wehner; p. 54, Text-fig. 12, Fig. 18B

Locality: Pfalzpaint.

Geological age: Late Jurassic (latest Kimmeridgian).

Occurrence: one incomplete carapace (JME n. cat. SOS4989, Wulf's collection n. cat. 0202) poor preserved posteriorly.

Discussion. The studied specimen, even though incomplete in the posterior part and covered by matrix on the right margin, has the shape of the carapace resembling that of *Pithonoton marginatum* (v. Meyer, 1842).

The main morphological characters are: small suboval carapace, longer than wide, convex superficially; wide front-orbital margin; bilobate front and turned backward; wide orbits with convex margin; short and divergent antero-lateral margin; convergent postero-lateral margins. The posterior part of the carapace is not preserved.

The regions of the carapace are well marked. Frontal region crossed by a longitudinal groove. Two epigastric protuberances are well developed. Narrow and elongate anterior meso-gastric process. Meso- and metagastric regions formed by a wide protuberance marked posteriorly by a convex incision running laterally with the cervical groove. Two gastric pits are present on the median part of the groove delimiting posterior the metagastric region. Urogastric region marked by two posterior lateral grooves. Subpentagonal cardiac region with elongate apex turned behind. The median part is rounded with two tubercles. Hepatic regions marked behind by cervical groove. Elongate branchial regions slightly inflated. Branchio-cardiac groove marking epibranchial region from posterior branchial. Dorsal surface of carapace with granulations.

The morphological characters and the stratigraphical distribution of *Pithonoton marginatum* (v. Meyer, 1842) were reviewed by Wehner (1988). This species was reported from the Oxfordian of Benerville, Calvados, Novion Porcine and Lothringen (France), the middle Oxfordian of Cabaço (Portugal), the upper Oxfordian of the Holy Cross Mountains and from Częstochowa (Poland), the Upper Jurassic of southern Germany: Lacunosamergel Formation of Geislingen, Gosheim, Böttingen and the Lochen area; Lower Felsenkalk Formation of Aalen and Geislingen a.d. Steige, Upper Felsenkalk Formation of Tuttlingen, upper Kimmeridgian coralliferous limestones of Saal near Kelheim, Massenkalk Formation of the Örlinger Tal near Ulm and Dischingen, upper Kimmeridgian of Grüntal near Regensburg, lower Tithonian coralliferous limestones of Graisbach near Donauwörth and Laisacker near Neuburg a. d. Donau, lower Tithonian Rennertshofen Formation and numerous other Oxfordian to Tithonian localities in Swabia and Franconia; in the Upper Jurassic of Switzerland: Birmenstorf Member of Nußdorf/Baselland, Zwingen near Blauen and Schaffhausen; in the French Upper Jurassic: Bec d'Echaillon (Dept. Isère); in the lower Tithonian of the Western Carpathians (Poland) and in the upper Tithonian of the Eastern Carpathians (Transsylvania, today Romania); in the Tithonian of Wozniki (Poland) and Štramperk (Czech Republic), and in the Tithonian of Sicily (Müller *et al.*, 2000).

Röper *et al.* (1999, p. 89, Fig. 104) reported another specimen of this species (catalogue number BMMS 619) recovered from the Upper Jurassic lithographic limestones of Pfalzpaint, now housed in the Bürgermeister-Müller-Museum in Solnhofen.

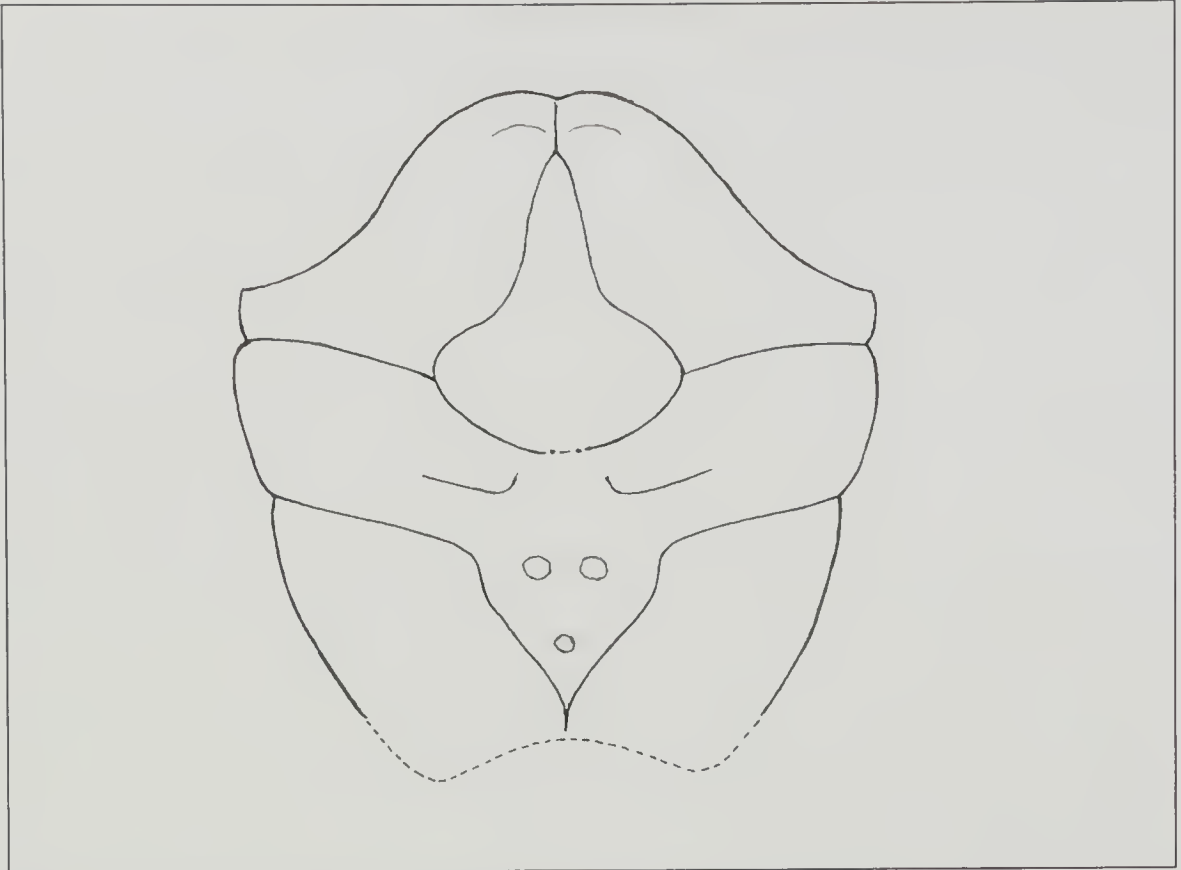


Fig. 2 - *Pithonoton marginatum* (v. Meyer, 1842), reconstruction (ricostruzione).



Fig. 3 - *Pithonoton marginatum* (v. Meyer, 1842), JME n. cat. SOS4989 (Wulf's collection n. cat. 0202, collezione Wulf) (x 9).

Pithonoton cfr. *P. serratum* (Beurlen, 1929)
Figs. 4, 5

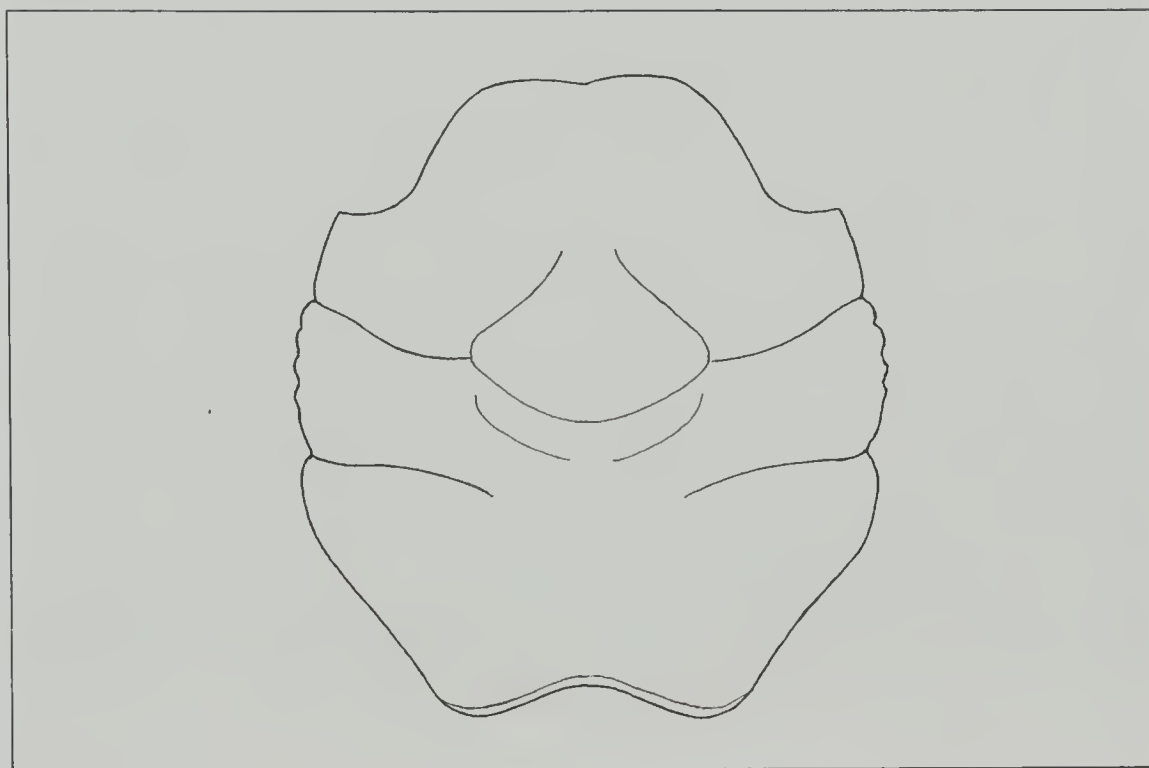


Fig. 4 - *Pithonoton* cfr. *P. serratum* (Beurlen, 1929), reconstruction (ricostruzione).



Fig. 5 - *Pithonoton* cfr. *P. serratum* (Beurlen, 1929), JME n. cat. SOS4990 (Wulf's collection n. cat. 9707 a-b, collezione Wulf) (x 8.5).

Locality: Öchselberg near Breitenhill.

Geological age: Late Jurassic (latest Kimmeridgian – early Tithonian).

Occurrence and measurements: one carapace (JME n. cat. SOS4990, Wulf's collection n. cat. 9707 a-b) preserved in dorsal view.

Carapace length: 7.5 mm

Carapace width: 7.4 mm

Description. Small carapace, subpentagonal and convex, as long as wide. Wide fronto-orbital margin. Bilobate and well-developed front. Wide orbits. Convex supra-orbital margin. Divergent antero-lateral margins, marked by a sinus made by cervical groove. Three or four lobes on epibranchial margin. Convergent postero-lateral margins, marked by a sinus made by branchial groove. Narrow and concave posterior margin with raised margin. Well-developed regions. Poorly preserved anterior regions. Meso- and metagastric regions formed by an oval lobe, marked behind by a groove joined at the extremities to cervical groove. Posterior part of metagastric region with two weak transverse grooves. Wide urogastric region marked by a posterior groove. Cardiac region poorly marked by branchio-cardiac grooves, rounded in median part and lowered behind. Elongate and poorly inflated branchial regions with an oblique branchial groove delimiting epibranchial region. Dorsal surface of carapace with granulations and roughness in the posterior part.

Discussion. The studied specimen has some morphological affinities with some known species, above all with *P. serratum* (Beurlen, 1929) from the Upper Jurassic (Oxfordian – Kimmeridgian) of Savonnières (Côte Lorraine, France). Common characters are the presence of lobate epibranchial margins, cardiac region marked by branchio-cardiac grooves and ornamentation of dorsal surface of carapace with granulations and roughness in the posterior part. However, the studied specimen has a weak lateral development of the orbits and the lack of the lateral spines. These differences could be produced by a poor state of preservation of the anterior margins of the carapace. For this reason the studied specimen is only compared with *P. serratum*.

Pithonoton sp.

Fig. 6

Locality: Öchselberg near Breitenhill.

Geological age: Late Jurassic (latest Kimmeridgian – early Tithonian).

Occurrence: a complete specimen (JME n. cat. SOS4991, Wulf's collection n. cat. 9708) poorly preserved.

Description. Small and poorly preserved specimen, but with remains of appendages. Subpentagonal carapace, convex on the surface. Bilobate frontal margin extending beyond the orbits. Sinuous branchio-cardiac grooves. Left branchial region inflated laterally and superficially, probably infected by isopods. Pereiopod I well-developed. Subcylindrical propodus, as high as long, with lower margin convex and granulate on outer margin. Short fixed finger. Movable finger longer than fixed finger and placed obliquely. Pereiopods II-V poorly preserved. Pereiopod V very short.

Discussion. Even though the studied specimen is poorly preserved it is compared with *Pithonoton*. The preservation of appendages is very unusual in prosopids and thus remarkable.

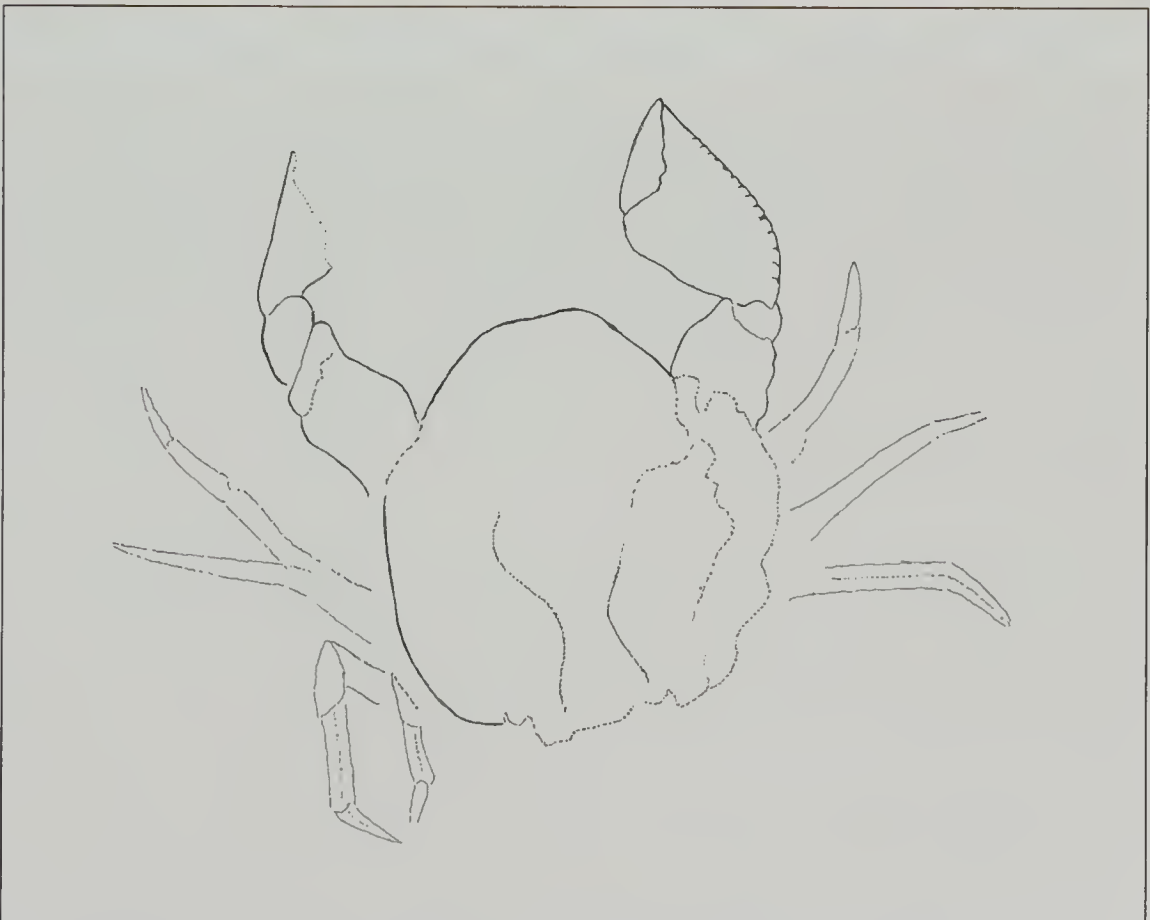


Fig. 6 - *Pithonoton* sp., JME n. cat. SOS4991 (Wulf's collection n. cat. 9708, collezione Wulf), (x 5).

Acknowledgements

We wish to thank M. Wulf, Rödelsee (Franconia, S Germany), for giving us the opportunity to study these specimens from his collection. Moreover, we thank R. M. Feldmann, Kent State University (Ohio) for his careful review of the manuscript.

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Ricevuto: 16 dicembre 2004

Approvato: 17 gennaio 2005